

CLAIMS

1. A method of producing an active matrix display device having an optical layer comprising a mixture of an electro-optical material and a polymer precursor, the method comprising:

producing an active plate comprising a substrate (60) carrying:

an array of pixel circuits each having a pixel electrode (12):

a plurality of row conductors (30) associated with rows of pixels;

and

a plurality of column conductors (34) associated with columns of pixels;

photo-processing an upper layer (70) of the active plate in dependence on a difference between the transmission or reflection characteristics of the row and column conductors and of the pixel electrodes, thereby to process the upper layer (70) in dependence on the row and column pattern or the pixel electrode pattern;

exposing the optical layer from above the substrate to a stimulus for polymerizing the polymer precursor into a discrete polymer surface layer (9), thereby enclosing the electro-optical material between the polymerized material and the active plate to define display pixels, and wherein enclosed bodies of electro-optical material defining display pixels are defined in a pattern defined by the processing of the upper layer (70).

2. A method as claimed in claim 1, wherein photo-processing an upper layer (70) of the active plate comprises using irradiation (72) through the substrate, and through the either the row and column conductors or through the pixel electrodes.

3. A method as claimed in claim 1 or 2, further comprising providing the optical layer mixture of an electro-optical material and a polymer precursor over the active plate after the processing of the upper layer (70).

4. A method as claimed in claim 3, wherein the upper layer (70) comprises a photo-resist layer deposited over the substrate.

5. A method as claimed in claim 4, wherein the photo-resist layer is a positive photo-resist, the row and column conductors (30,34) are not transparent to the irradiation used in the processing and the pixel electrodes (12) are transparent to the irradiation used in the processing.

6. A method as claimed in claim 5, wherein the processing comprises removing the exposed photo-resist to leave regions (70a,70b) of photo-resist over the row and column electrode pattern.

7. A method as claimed in claim 4, wherein the photo-resist layer is a negative photo-resist, the row and column conductors are transparent to the irradiation used in the processing and the pixel electrodes are not transparent to the irradiation used in the processing.

8. A method as claimed in claim 7, wherein the processing comprises removing the non-exposed photo-resist to leave regions of photo-resist outside the pixel electrode pattern.

9. A method as claimed in claim 6 or 8, wherein the optical layer mixture is provided in the spaces between the remaining photo-resist regions.

10. A method as claimed in claim 9, wherein the optical layer mixture is also provided over the remaining photo-resist regions.

11. A method as claimed in any one of claims 4 to 10, wherein display pixel cells are enclosed by photo-resist layer side walls, the active plate, and the polymer surface layer.

12. A method as claimed in claim 1 or 2, further comprising, after producing the active plate, providing the optical layer mixture of an electro-optical material and a polymer precursor over the active plate, and wherein the upper layer comprises the optical layer mixture (84).

13. A method as claimed in claim 12, wherein the row and column conductors (82) are transparent to the irradiation used in the processing and the pixel electrodes are opaque to the irradiation used in the processing, and the processing thereby forms polymerized side walls (86) over the row and column conductor pattern.

14. A method as claimed in any preceding claim, further comprising applying a liquid crystal alignment layer over the active plate.

15. A method as claimed in claim 14, wherein a photosensitive alignment layer is provided over the active plate, and wherein when irradiating through the substrate, regions of the photosensitive alignment layer are activated.

16. A method as claimed in claim 15, wherein the irradiating uses polarized UV light.

17. A method as claimed in any preceding claim, wherein the electro-optical material comprises a liquid crystal material.

18. An active matrix display device having an optical layer comprising a mixture of an electro-optical material and a polymer precursor, comprising:

an active plate comprising:

a substrate (60) carrying an array of pixel circuits, each having a pixel electrode (12);

a plurality of row conductors (30) associated with rows of pixels;

and

a plurality of column conductors (34) associated with columns of pixels; and

an array of display pixels comprising electro-optical material enclosed between side walls, a polymerized surface layer (9;88) of the mixture and the active plate, and wherein the side walls are aligned over the row and column conductor pattern (30,34).

19. A device as claimed in claim 18, wherein the side walls (86) are formed from polymerized regions of the mixture.

20. An active matrix display device having an optical layer comprising a mixture of an electro-optical material and a polymer precursor, comprising:

an active plate comprising:

a substrate (60) carrying an array of pixel circuits, each having a pixel electrode (12);

a plurality of row conductors (30) associated with rows of pixels;
and

a plurality of column conductors (34) associated with columns of pixels; and

an array of display pixels comprising electro-optical material enclosed between side walls, a polymerized surface layer (9) of the mixture and the active plate, and wherein the side walls are aligned with the spaces between the pixel electrode pattern.

21. A device as claimed in claim 18 or 20, wherein the side walls are formed from photo-resist.

22. A device as claimed in any one of claims 18 to 21, further comprising a liquid crystal alignment layer over the active plate.

23. A device as claimed in any one of claims 18 to 22, wherein the electro-optical material comprises a liquid crystal material.